

as entomology is concerned. (Bull. Sta. Isl. Inst. Art Sci.) It is of importance to bring this to the attention of the entomologist in general, therefore, with apologies to Mr. Burns, the record is here repeated. It seems to indicate that this species is very likely to be met with wherever the Tamarisk is grown, and no doubt it causes considerable injury to these plants, as it usually occurs in very great numbers. In all probability, like other insects of foreign introduction, they have come here leaving their natural enemies behind.

I may add that the two trees, on which I previously found this insect so very abundant, were in such unhealthy condition that one of them was destroyed by a recent snowstorm. There is no doubt that these insects are partly responsible for the poor health of these particular trees.

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### THE PHYLLOPHAGA (SCARAB. COLEOP.) OF HAWTHORN (CRATAEGUS).<sup>1</sup>

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A study of the fauna of trees is always interesting and especially the different species of a single genus that inhabit a particular kind of tree. Quite often the different members of a generic group prefer different food plants and the occurrence of several species of one genus feeding on a single species of tree offers opportunity to study food preferences as exhibited by closely related forms. Such is the case with the May beetles (*Phyllophaga* spp.) on hawthorn (*Crataegus* spp.). For several years the writers have been studying the food habits of *Phyllophaga* in the vicinity of Manhattan, Kansas, and it is their intention to present from time to time short summaries of the fauna of the more important trees of the region.

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<sup>1</sup> Contribution No. 80 from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results obtained in the prosecution of project No. 100 of the Agricultural Experiment Station.

Forbes<sup>2</sup> presents some interesting data on the food habits of *Phyllophaga* in Illinois which offers opportunity to compare the food of the various species in Kansas and Illinois. A total of 73,656 May beetles were collected by him on various food plants from 1907 to 1913. Of these, 399 were taken on hawthorn, representing 25 collections with an average of 16 per collection. The writers, during the period of 1917 to 1920, inclusive, collected on various food plants 22,570 beetles, of which 4,071 were taken on two species of hawthorn (*Crataegus mollis* and *C. crus-galli*). The total of beetles taken represent 122 collections, or an average of 33.3 per collection. These are compared with the Illinois collection in Table I.

TABLE I.—COMPARISON OF KANSAS AND ILLINOIS COLLECTIONS.

Collection.	Period.	Total Beetles from All Food Plants.	Number Collections on Hawthorn.	Total Beetles on Hawthorn.	Average per Collection.	No. of Species Represented.	Per cent. of Hawthorn to Total Collections.
Illinois....	1907-13	73,656	25	399	16	9	.005
Kansas....	1917-20	22,570	122	4,071	33.3	10	18.00

From a food plant of relatively little importance in Illinois, as shown by less than 1 per cent. of the total collections, hawthorn in Kansas, with 18 per cent. of all collected beetles found on it, becomes an important food of May beetles. This, as will be shown later, is accounted for by the presence of *P. rubiginosa* in Kansas and its absence in Illinois. It should, however, be stated that the Illinois collection represents the State as a whole, while the Kansas collection was made only in the vicinity of Manhattan, Kansas.

During the four-year period the writers collected ten species of *Phyllophaga*, which rank in importance in the order named—*rubiginosa*, *futilis*, *rugosa*, *hirticula*, *vehemens*, *crenulata*, *crassissima*, *implicata*, *bipartita*, and *corroasa*. The total of all species collected on *Crataegus mollis* are shown in Table II. The 282

<sup>2</sup> Forbes, S. A., "A General Survey of the May-Beetles (*Phyllophaga*) of Illinois," Ill. Agr. Exp. Sta., Bull., 186, pp. 215-257, 1916.

beetles not accounted for in Table II were taken on *C. crus-galli* and will be discussed later.

TABLE II.—COLLECTIONS OF MAY BEETLES ON CRATAEGUS MOLLIS.

Species.	1917.	1918.	1919.	1920.	Total.
<i>Rubiginosa</i> .....	1,584	102	44	1,793	3,523
<i>Futilis</i> .....	35	9	21	96	161
<i>Rugosa</i> .....	19	4		23	46
<i>Hirticula-comosa</i> .....	15			30	45
<i>Vehemens</i> .....	1	1		3	5
<i>Crenulata</i> .....	2			1	3
<i>Crassissima</i> .....				2	2
<i>Implicata</i> .....				2	2
<i>Bipartita</i> .....				1	1
<i>Corrosa</i> .....				1	1
	1,656	116	65	1,952	3,789

The years 1917 and 1920 were the periods of flight of the major brood of beetles and the figures show well the three-year life cycle of *P. rubiginosa*. Approximately 93 per cent. of all beetles collected on *C. mollis* were of this species, the other 7 per cent. being composed of three relatively important species, *futilis*, *rugosa*, and *hirticula*, and six unimportant species.

Arranging the data as to number of collections, we find that of 122 made on hawthorn, 95 were made on *C. mollis*, while 27 were on *C. crus-galli*. The number of individuals and species in each set of yearly collections and the average per collection are shown in Table III.

TABLE III.—SHOWING NUMBER OF COLLECTIONS AND AVERAGE OF INDIVIDUALS COLLECTED.

Species of Trees.	Year.	Number of Collections.	Number of Species Collected.	Number of Individuals Taken.	Average per Collection.
<i>C. mollis</i> .....	1917	34	6	1,656	48
	1918	22	4	116	5
	1919	20	2	65	3
	1920	19	10	1,952	102
Total.....		95	10	3,789	40
<i>C. crus-galli</i> .....	1917	27	7	282	10
Total of both trees.....		122		4,071	33

The average number of individuals per collection varied from 3 to 102, depending on the years of abundance and the number of species collected. Comparing the collection on two trees in 1917 with that on one tree in 1920, the numbers are 1,938 and 1,952, or nearly equal.

The 1917 collection was made on two species of *Crataegus crus-galli* and *C. mollis*. A great difference in the apparent attractiveness of the two trees was noted, although they stood side by side and their branches interlocked. The difference in collections is shown in Table IV.

TABLE IV.—COMPARISON OF 1917 COLLECTIONS ON *C. CRUS-GALLI* AND *C. MOLLIS*.

Species.	Number of Individuals.	
	<i>C. mollis</i> .	<i>C. crus-galli</i> .
<i>rubiginosa</i> .....	1,584	254
<i>futilis</i> .....	35	18
<i>rugosa</i> .....	19	6
<i>hirticula</i> .....	15	1
<i>crenulata</i> .....	2	0
<i>vehemens</i> .....	1	1
<i>implicata</i> .....	0	1
<i>crassissima</i> .....	0	1
	<hr/> 1,656	<hr/> 282

As can be seen from Table IV, slightly over six times as many *rubiginosa* were taken on *C. mollis*, nearly twice as many *futilis*, and three times as many *rugosa*.

A study of the proportion of sexes shows that large percentage differences occur only among the species in which few individuals are represented. Males of *Phyllophaga* are known to predominate at lights, and from the four important species concerned in this study it can be seen that they are also more numerous on hawthorn. The sex ratios and their totals for the four years are shown in Table V.

TABLE V.—PROPORTION OF SEXES OF ALL INDIVIDUALS COLLECTED ON HAWTHORN.

Species.	1917.			1918.			1919.			1920.			Totals.			% ♀ ♀
	♂	♀	To- tal.	♂	♀	To- tal.	♂	♀	To- tal.	♂	♀	To- tal.	♂	♀	To- tal.	
<i>Rubiginosa</i> .....	949	889	1,838	51	51	102	33	11	44	1,055	738	1,793	2,088	1,689	3,777	44
<i>Futilis</i> .....	21	32	53	2	7	9	13	8	21	68	28	96	109	75	179	41
<i>Rugosa</i> .....	14	11	25	3	1	4				12	11	23	29	23	52	44
<i>Hirticula</i> .....	9	7	16							21	9	30	30	16	46	34
<i>Vehemens</i> .....	2	0	2	1	0	1				2	1	3	5	1	6	15
<i>Crenulata</i> .....	2	0	2							1	0	1	3		3	0
<i>Crassissima</i> .....	1	0	1							1	1	2	2	1	3	33
<i>Implicata</i> .....	1	0	1							1	2	2	1	2	3	66
<i>Bipartita</i> .....										1	1	1	1	1	1	0
<i>Corrosa</i> .....										1	1	1	1	1	1	0
													2,261	1,807	4,071	

Summing up, it can be stated that hawthorn has one important *Phyllophaga* enemy in Kansas—*P. rubiginosa*—which does not occur in Illinois. Because of its absence, hawthorn is considered a relatively unimportant food plant of May beetles in Illinois, while in Kansas it constitutes 18 per cent. of the total food plant collections. Ten species of *Phyllophaga* were found to feed on trees of the genus *Crataegus* in Kansas, while nine occur in Illinois. An apparent choice is exercised by the May beetles among some species of the genus *Crataegus*, as was noted when two different species whose branches interlocked showed simultaneous collections of 1,656 and 282 beetles.